A 200 MHz Bandwidth, 4096 Spectral Channels, 3 W Power Consumption, Digital Auto-Correlation Spectrometer Chip for Spaceborne Microwave Radiometers, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

NASA?s program for Exploration of the Solar System requires high-resolution microwave spectrometers for the analysis of chemical composition and physical properties of solar system atmospheres. The anticipated results of the proposed R/R&D effort (Phase I and II), if the project is successful, are to demonstrate experimentally the first digital auto-correlation spectrometer on a single chip for spaceborne microwave radiometers with the following important characteristics: (a) a bandwidth of 200 MHz, (b) 4096 spectral channels for high-resolution spectroscopy, (c) less than 3 W power consumption, (d) a mass of less that 800 grams, and (e) a space-qualifiable design and fabrication technology. The innovative approach proposed for achieving these significant objectives consists of a synergistic combination of the following: (a) a unique parallel architecture that will reduce the operating clock frequency, relative to a single-stream architecture, by a factor of 2 and consequently will lower significantly the power consumption, (b) novel differential analog and digital circuits that will improve robustness while operating in the presence of total dose natural radiation found in the space environment, and (c) an advanced 0.13 um CMOS fabrication process available from IBM for manufacturing high-performance, low-power, reliable, and robust (total dose radiation and latch-up resistant) space-qualifiable chips.

Anticipated Benefits

The proposing firm will focus on the marketing a family of state-of-the-art digital auto-correlation spectrometers. There are several non-NASA scientific and commercial markets with a high demand for digital auto-correlation spectrometers such as radio-astronomy, atmospheric research, imaging arrays for detection of weapons and explosives, telecommunication, and medical imaging The space-qualifiable, digital auto-correlation spectrometer chip developed in the proposed project will be commercialized to several NASA programs such as the Exploration of the Solar System, Earth Remote Sensing, and space-based radio-astronomy. If the proposed project is successful, it will provide a digital spectrometer chip with such a low power consumption and small mass that it will enable space science missions that were not previously possible.

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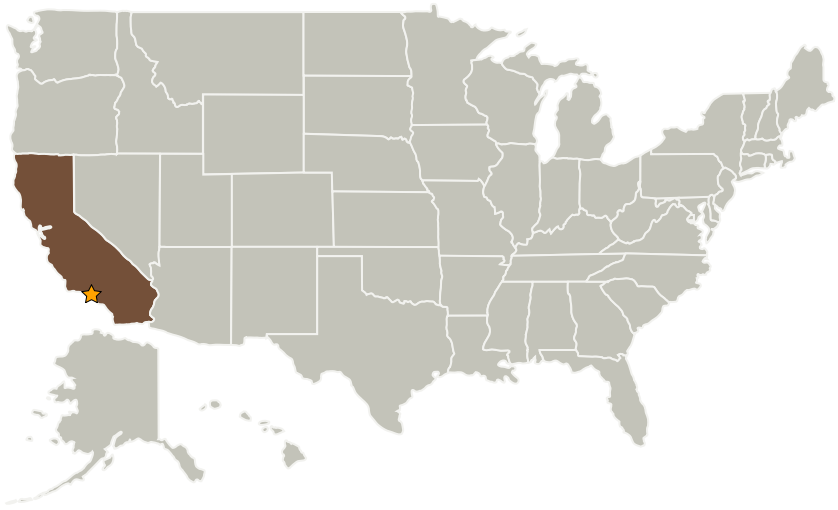
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Spaceborne, Inc.	Supporting Organization	Industry	La Canada, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Celestino Jun Rosca

Principal Investigator:

Constantin Timoc

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors

Continued on following page.

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Technology Areas *(cont.)*

- TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves